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ABSTRACT

This paper describes the pilot project for a model of automatically generated customizable World Wide Web (WWW) sites for on-campus classes at the Graduate Department of Production and Systems Engineering, Federal University of Santa Catarina, Brazil. This project is being integrated into the department's STELA system, the first Brazilian Java and databank-based university administration system. The WWW classroom sites component facilitates teaching and learning via improved access to internal and external resources, and improved student/student and student/teacher communication and collaboration. The purpose of this project is to incorporate the use of the learning networks into the present classroom with the goal of familiarizing both students and teachers with the use and advantages of information technologies, ultimately helping users to be better prepared to enter the production engineering workforce of today. Technical aspects of the system are described, and ideals for interface and hypermedia teaching/learning environments are discussed. (Author)

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A Classroom Model for WWW Use in Modern Engineering Education

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Abstract *This paper describes the pilot project for a model of automatically generated customizable WWW sites fo ron-campus classes at the Graduate Department of Production and Systems Engineering, Federal University of Santa Catarina, Brazil. This project is being integrated into the department's STELA system, the first Brazilian Java and databank-based university administration system. The WWW classroom sites component facilitates teaching and learning via improved access to internal and external resources, and improved student/student and student/teacher communication and collaboration. The purpose of this project is to incorporate the use of the learning networks into the presencial classroom with the goal of familiarizing both students and teachers with the use and advantages of information technologies, ultimately helping users to be better prepared to enter the production engineering workforce of today. Technical aspects of the system are described, and ideals for interface and hypermedia teaching/learning environments are discussed.*

Introduction

In the era of globalization and rapid dissemination of new information technologies, the concept of "virtual" is becoming a reality that is breaking down old barriers and creating new ones in the way business and study is conducted. An area where this is becoming especially apparent is in higher education. Universities around the world are beginning to use the Internet and other information technologies such as video and teleconferencing systems to deliver entire courses online, in a formats more interactive and flexible than traditional distance education. For example, the Western Governor's consortium of over 20 universities across 13 states in the USA offers students the opportunity to mix and match online courses to fulfill degree requirements, offering students many more options than a single university could. [Hamilton, K., & Miller, S.] Administrators working in São Paulo are now able to achieve an MBA from the Massachusetts Institute of Technology via video conference, permitting them to gain this prestigious degree without having to put their jobs on hold and relocate to the US while studying. As the barriers of location and scope fall away, a world of opportunity in education is unfolding. For the generations advancing, this will be the norm. For the current university-level generation that has grown up in classrooms where little technology was used, this transition means going through a process of updating skills in computers and networks, understanding new methods of learning and teaching and new formats for acquiring information, all of which can represent barriers. This calls for a methodology whereby students (and teachers) can become familiarized with the use and advantages of information technologies, and the new possibilities these hold for collaboration and interaction.

This paper describes the pilot project for incorporating learning networks into campus-based classrooms in the form of interactive WWW sites of the Graduate Department of Production and Systems Engineering, Federal University of Santa Catarina, Brazil. This project has the goal of

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helping students in overcoming entrance barriers in a world of opportunity provided by information technologies , and ultimately better preparing them to enter the production engineering workforce of today.

Justification

The need for creating a WWW model for on-campus classes in this department was evident. The PPGEP is already very advanced in distance education technologies and university administration software. It hosts the headquarters for the multi-point videoconferencing hub between all the universities of the state, which are supplemented by Internet sites, working in coordination with the State Secretary of Education in projects for primary school teacher technology training and curriculum upgrade. There are also specialization and masters' level courses being offered completely online, integrated with industry and teacher training and support. The department's STELA System is the first Brazilian Java and databank-based university administration system, where students register themselves for courses, make requests for official documents, and view course grades and pertinent departmental information, greatly easing the workload of the head office. The system also offers a professor module which gives statistical information on classes, etc.

The classroom sites have emerged as a natural and necessary extension of the STELA system, and an important step towards matching the advanced level of the department's distance education technologies. Much of the information that is represented on the classroom WWW sites is already captured in STELA's databank, and the STELA interface is accessible on the Internet, so makes more sense to simply use programs to automatically generate and update Web sites than to have labor-intensive HTML pages created manually for each classroom. Also, students on campus should have every opportunity to take advantage of the benefits of new information technologies that the distance education students of the department enjoy. This is true not only to help them be prepared for the eventual opportunities that will arrive virtual education, and the use of technology in the workplace, but also so that they may benefit from the results of research, evaluation and new pedagogical models that have emerged through the experience of the department's Distance Education Laboratory.

The advantages of information technology use in education are rapidly being discovered by leading researchers and institutions around the globe. Internet technology is known to be beneficial because from a user's perspective, is relatively easy to understand and operate [Trentin, G. 1996], and has 5 main qualities attributed to it which are advantageous for students and teachers alike:

1.Time independence (can be accessed at any time)
2.Place independence (accessible from anywhere)
3.Cross-platform (information from various computer platforms can be accessed)
4.Easy to produce, publish and access material
5.Low-cost.

It also offers opportunities for collaboration and resource sharing from a local to international level, a quality of extreme importance in light of globalization.

Description

This project has two main components: the modeling of customizable WWW sites for the disciplines of the department, and the creation of interactive Internet "tools" for the automatic generation of the "pages" within the sites. The site model that was created includes 10 "pages" in total: a welcome page (see figure 1); a bulletin board, the course outline; course schedule; bibliography; relevant WWW links; students; discussion forum; seminars; summaries of final papers.

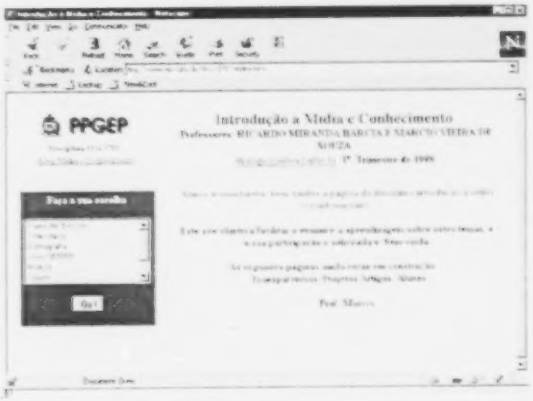

Figure 1. Customizable Welcome Page

The tools used to automatically generate the pages incorporate scripts to integrate static HTML pages as well as dynamic pages from information derived from the STELA database. Via filling out HTML forms templates, teachers make available information such as the course schedule and information, reading materials, related WWW links, etc. Students contribute to the site outside of classroom hours via a discussion forum and forms for uploading project abstracts, presentations, biographies, groupwork, etc. Figure 2 shows the form which, once filled out by the teacher, automatically generates the welcome page of the class, which was shown in figure 1.

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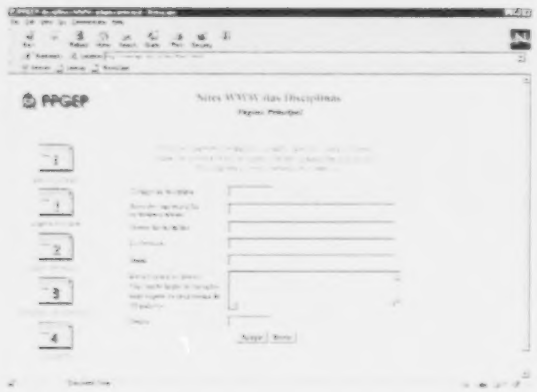

Fig. 2. Form for automatic creation of welcome page

Ideals, Interface and Hypermedia

Internet technology allows information to be accessed and exchanged via graphical interface and hypermedia. When modeling the sites, it was useful to keep in mind 3 functions that this mode of information presentation should perform, as described well by Glenn and Chignell [Faust, R. 1996]:

1. Make information readily accessible
2. Make pathways in information more obvious
3. Have a system that can be understood by many people

In order for these three functions to be met, the project was structured around the principle of simplicity. Hypertext and hypermedia formats offer many advantages that could become disadvantages if not well planned. For example, users have the freedom to follow links (or not) in any order with these formats, but if links are not and well defined, the user may waste time searching for information, or fail to access the most important material. Thus, a system of navigation was chosen with clear descriptions to links, allowing students to access any page from each within the classroom site. Another important aspect is the relevance of links to existing teaching methodologies. For example, the *seminars* and *summaries of final papers* links within the site reflect the teaching format commonly used in the department.

To the three fundamental aspects listed above, a fourth can be added: to always keep in mind the overall objective of using hypermedia environments and information technology. The WWW environments modeled in this project are designed to facilitate classroom-based teaching and learning via improved communication, collaboration and access to internal and external resources. Since this goal is largely achieved outside of regular classroom hours, it is useful to consider Micheal Moore's theory of three main types of interaction important in distance education: student/teacher, student/student, and student/content [Moore, M. 1989]. This project uses the Internet to facilitate all three areas of interaction in classroom education, since learning and interaction traditionally does not only occur during classroom hours. For improved student/teacher interaction, the teacher uses e-mail or a section of the class home page to notify students of deadlines, return assignment grades, list questions for thought to prepare students for the next class, etc. In the same vein, students use e-mail or a web-page form to contact the teacher, avoiding the hassles of telephone tag or office hours. The administrative tasks of the teacher are diminished via providing tools for students to register themselves for seminars, and define workgroups via online forms. Student/student interaction is greatly convenienced by e-mail and the classroom electronic forum, providing students with a centralized place to arrange meetings, compare work produced, and share camaraderie and ideas outside of classroom hours. Student/content interaction is made simple via posting the course syllabus, schedule and any other supplementary course material online, such as links to relevant documents found on the WWW.

The benefits of automatically generated classroom sites are obvious for users and the department alike. While online, students can access more information about each discipline before deciding to register, and previous semesters' sites are archived into the databank as a rich resource base for the next semester's group to build upon. Thus, with each semester, students are knowledge building and collaborating not only with current colleagues, but also with past and future ones. Such a database also provides teachers and the institution with a history of the work and progress different classes have had over several semesters, which will certainly be useful in adjusting or upgrading curriculum and course content. The strong point of the system is that neither faculty nor students need to know how to program in HTML, yet may participate in publishing and contributing material to the WWW. This helps to break down perceived barriers of complexity and facilitates learning about the benefits and use of information technologies in modern engineering education.

Conclusion

This paper describes the pilot project for a model of automatically generated customizable WWW sites at the Graduate Department of Production and Systems Engineering, Federal University of Santa Catarina, Brazil. This model incorporates a simple and easy to understand interface, relevant to the teaching style currently used within the department, and includes several interactive forms and data-bank based tools designed to facilitate teaching and create learning networks for teachers and students on campus. It is hoped that through the exposure to these

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fundamental internet tools, users will become familiarized with the benefits of information technologies, and this will ultimately help them to cope in the modern workforce.

Email and WWW sites are the most basic components of Internet technology. The scope of this technology actually includes anything from computer-based training (intelligent tutor), shared whiteboards, and collaborative groupware, to text/audio or desktop video conferencing and virtual worlds. Although tools are not yet optimal, as network capacities and new research in teaching methodologies evolves, applications of networked technology will become increasingly sophisticated and potentially present many more learning benefits (that is, if teachers and students are prepared to make good use of them). In the meantime, every effort should be made to ensure that the first practical steps are taken to using information technology in today's classrooms, especially at the university level, where adult students will soon be entering the workforce.

It is also important to stress that although Internet technology can be a wonderful supplement for facilitating teaching and learning in any class, it also has the potential to be incorporated into new teaching methodologies better designed to give students important skills for life in an information age. Lauren Rosen [Rosen, L. 1997] has compiled an extensive list of examples showing the many ways that the resources found on the Internet could be incorporated into classroom activities, and further insight on incorporating technology and teaching methodologies can be extracted from Sandholtz et. al. [Sandholtz, J; Ringstaff, C; Dwyer, D. 1997] . These skills are gained by practicing activities that mirror the reality of the modern workplace, where globalization and informatics have caused radical, on-going changes. Since it is becoming evident that this new age necessitates a learning that will be continuous, flexible, available at any time and from any place, every effort should be made to search for appropriate pedagogical methods stressing student self-responsibility and collaboration; one which uses all the benefits of computers and network connectivity.

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